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Larval development of *Epialtus bituberculatus* H. Milne Edwards, 1834 (Crustacea: Decapoda: Brachyura: Majidae) with comments on majid larvae from the southwestern Atlantic

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Abstract.—The larval development of the spider crab *Epialtus bituberculatus* H. Milne Edwards which lives on rocky shores with algae such as *Sargassum* and *Hypneia,* is described. Larvae were obtained from ovigerous females collected in Ubatuba, State of São Paulo, Brazil. Rearing was carried out at 24 ± 1°C, with an average salinity of 35‰. Larval development consists of two zoeal stages and one megalopa. Zoeal development was completed in 9.5 days. Analysis indicated that zoeae of *E. bituberculatus* are very similar to those of *E. brasiliensis* Dana and *Acanthonyx scutiformis* (Dana). Differences noted between these species pertain to the setation of the carapace, maxillule and second maxilliped. The main morphological features useful for identification are presented together with a summary of features that characterize larvae of majid subfamilies in Brazil. A key for the identification of southwestern Atlantic majid zoeae to the family level is provided.

The understanding of evolutionary relationships amongst crabs is largely based on adult morphology. Unlike benthic adults, crustacean larvae are planktonic and therefore not subject to the same selection pressures as later stages. Therefore, larvae contain a much neglected source of characters that may help solve relationships obscured in adults. For example, larval characters have been shown to be useful as phylogenetic evidence to group subfamilies (Marques & Pohle 1998). However, while improvements in laboratory rearing techniques since the middle of this century have increased the knowledge on larvae, developmental stages are still unknown for the majority of brachyurans and decapods.

In the southwestern Atlantic, along the coast of Brazil, Uruguay and Argentina, brachyurans are represented by 329 species in 170 genera and 24 families (Boschi et al. 1992, Melo 1996, Pohle et al. 1999). According to Melo (1996), the Brazilian fauna is composed of 302 brachyuran species but larval development is known for less than one third of these taxa (Pohle et al. 1999).

The Majidae is one of the most diverse brachyuran families, with approximately 900 species worldwide. In the Southwest Atlantic this group is represented by 83 species among the subfamilies Epialtinae, Inachinae, Inachoidinae, Mithracinae, Pisinae and Tychinae (Melo 1996). Details on larval development is known for only 19 of these species: *Libinia spinosa* H. Milne Edwards, 1834 (Boschi & Scelzo 1968, Clark et al. 1998); *Libidoclaea granaria* H. Milne Edwards & Lucas, 1843 (Fagetti 1969); *Taliepus dentatus* (H. Milne Edwards, 1834) (Fagetti & Campodonico 1971); *Anasimus latus* Rathbun, 1894 (Sandifer & Van Engel 1972); *Eurypodius latreillei* Guérin-Méneville, 1828 (Campodonico & Guzmán 1972); *Stenorhynchus seticornis* (Herbst, 1788) (Yang 1976); *Mithraculus forceps* (A. Milne-Edwards, 1875) (Wilson et al. 1979 as *Mithrax* (*Mithraculus*) *forceps*); *Mithraculus coryphe* (Herbst, 1801) (Scotto & Gore 1980 as *Mithrax* (*Mithraculus*) *coryphe*); *Mithrax verrucosus* H. Milne Edwards, 1832 (Bolaños & Scelzo 1981); *Microphrys bicornutus* (Latreille, 1825) (Gore et al. 1982); *Mithrax hispidus* (Herbst, 1790) (Goy et al. 1981 as *M. pleuracanthus* Stimpson, 1871 and cf. Fransozo & Hebling, 1982); *Mithrax caribbaeus* Rathbun, 1920 (Bolaños et al. 1990); *Libinia ferreirae* Brito Capello, 1871 (Bakker et al. 1990); *Epialtus brasiliensis* Dana, 1852 (Negreiros-Fransozo & Fransozo 1991); *Acanthonyx scutiformis* (Dana, 1851) (Hiyodo et al. 1994 as *A. petiverii* H. Milne Edwards, 1834); *Pitho lherminieri* (Schramm, 1867) (Bolaños et al. 1996); and *Pyromaia tuberculata* (Lockington, 1876) (Fransozo & Negreiros-Fransozo 1997).

According to Melo (1996), the species subject of this study *Epialtus bituberculatus* H. Milne Edwards 1834, is found on the coasts of Florida, Gulf of Mexico, Antilles, Colombia, Venezuela, and in Brazil from Ceará to São Paulo States. In the present study all larval stages of *E. bituberculatus,* reared under laboratory conditions, are described and compared with other majid larvae from the southwestern Atlantic.

Material and Methods

Three ovigerous females of *E. bituberculatus* were hand-collected intertidally along rocky shores of Ubatuba (23°28′00″S, 45°03′33″W), on the northern Coast of São Paulo State, where they are associated with algae of the genera *Sargassum* and *Hypneia.* The crabs were transported from the collection sites to the laboratory using insulated 20 liters containers with one liter of sea water.

In the laboratory, ovigerous females were maintained at constant temperature (24 ± 1°C) in a 10 liters aquarium filled with sea water (35‰), and provided with continuous aeration until larvae hatched. Crabs were fed with a continuous supply of living algae, supplemented by fresh fish muscle tissue offered twice a week. Ovigerous females were inspected daily for hatched larvae or pre-zoeae. The larvae were reared following the techniques described by Negreiros-Fransozo & Fransozo (1991). Two hundred freshly hatched zoeae from a single female were transferred to an acrylic vessel with 50 ml filtered and aerated sea water at 35‰ and 24 ± 1°C, one larva per container. A light regime of 12 hours dark/light was maintained. Seawater was changed daily after examining the condition of larvae, followed by feeding with about 20 newly hatched *Artemia* nauplii per larva. Larvae were preserved in a 1:1 mixture of 96% ethyl alcohol and glycerin, whereas exuviae were kept in pure glycerin. Illustrations by light microscopy and the aid of *camera lucida* were made from live and preserved larvae, and from exuviae. For morphological descriptions, the setation is given from proximal to distal segments. Ten specimens were examined for the description and measurements of each larval stage. The descriptive terminology of Bookhout & Costlow (1974), and Pohle & Telford (1981) was used here. Specimens of each larval stage are deposited in the collection of Departamento de Zoologia, Instituto de Biociências, UNESP, Botucatu, SP, Brazil under #NEBECC 000026.

Results

The larval development of *E. bituberculatus* consists of two zoeal stages followed by the megalopa. The zoeal phase lasted 9.5 ± 0.3 days. The duration of the complete larval development was not determined because none of the megalopae moulted to the first crab instar.

Description of *E. bituberculatus* larvae
Zoea I (Fig. 1I; 2 a–g; 4I)

Size.—carapace length: 0.61 ± 0.02 mm

Carapace (Fig. 1I).—With rostral and dorsal spine, but lacking lateral spines. With 2 postorbital plumose setae. Postero-lateral margin bearing 7 plumose setae. Eyes sessile.

Abdomen (Fig. 4I).—Five cylindrical somites, somite 6 fused to telson. Only somite 2 has pair of knobs laterally. First somite with 3 simple setae dorsally. Posterodorsal margin of somites 2–5 with 2 small setae.

Telson (Fig. 4I).—Bifurcated, each furcal shaft covered with spinules and bearing lateral spine. Furcal arch bears 3 pairs of plumodenticulate processes.

Antennule (Fig. 2a).—Conical, unsegmented, with 3 terminal aesthetascs and 1 simple seta.

Antenna (Fig. 2b).—Protopod an elongate tapering process with rows of spinules distally; exopod shorter than protopod, with 2 short simple setae apically; endopod as a bud medially on protopod.

Mandible (Fig. 2c).—With asymmetric small teeth on incisor and molar processes. No palp.

Maxillule (Fig. 2d).—Coxal endite with 6 (7) setae. Basial endites with 8 setal processes. Two-segmented endopod bearing 2 subterminal and 4 terminal plumodenticulate setae on distal segment.

Maxilla (Fig. 2e).—Coxal endite unilobed, 4 plumose subterminal setae and 2 plumose terminal setae. Basial endite with 4 and 5 (6) setae on proximal and distal lobe, respectively. Unsegmented endopod bears 4 terminal and 2 subterminal setae. Scaphognathite with 12 marginal plumose setae and narrow posterior apical process.

First maxilliped (Fig. 2f).—Coxopodite naked. Basipodite bearing 2, 2, 3, 3 posterior marginal setae. Endopod 5-segmented, with 3, 2, 1, 2, 5 (6) setae. Exopod 2-segmented, with 4 terminal natatory setae.

Second maxilliped (Fig. 2g).—Coxopodite naked. Basipodite bearing 2 posterior marginal setae. Endopod 3-segmented, with 0, 1 and 4 setae, respectively. Exopod 2-segmented, with 4 natatory setae on distal segment.

Third maxilliped and developing pereiopods.—Present as buds under the carapace.

Zoea II (Figs. 1II; 3 a–g; 4II)

Size.—carapace length: 0.73 ± 0.04 mm

Carapace.—With 9 plumose setae on postero-lateral margin. Eyes stalked (Fig. 1II). Sixth abdominal somite (Fig. 4II) separated from telson. Somites 2–5 bearing 2 simple setae on posterior margin and somite 6 without setae. Knobs on somite 2 reduced. Somites 2–5 with biramous pleopod buds (Fig. 1II).

Antennule (Fig. 3a).—With 5 terminal aesthetascs and 1 simple seta.

Antenna (Fig. 3b).—With endopod enlarged.

Mandible (Fig. 3c).—With anterodorsal palp bud.

Maxillule (Fig. 3d).—Coxal endite with 8 plumose and 2 simple setae. Basial endite with 11 setal processes. Endopod with 1 plumose seta on proximal and 2 + 4 on the distal segment.

Maxilla (Fig. 3e).—Coxal endite unilobed with 2 plumose subterminal and 4 plumose terminal setae. Basial endite with 5 setae on each lobe. Endopod with 3 (4) terminal and 2 subterminal setae. With 20 (21) + 3 marginal plumose setae on scaphognathite.

First maxilliped (Fig. 3f).—Basipod with 2, 2, 3, 3 plumose setae. Exopod with 6 natatory setae.

Second maxilliped (Fig. 3g).—Exopod with 6 natatory setae.

Third maxilliped and *pereiopods* present as rudimentary buds.

Megalopa (Figs. 4M; 5; 6 a–h; 7 a–j)

Size.—Carapace length: 1.17 ± 0.04 mm; carapace width: 0.72 ± 0.04 mm.

Carapace.—Smooth, longer than wide, sub-rectangular posteriorly to orbits (Fig. 5). Short rostrum deflected ventrally. Covered by few setae as shown.

Abdomen. (Fig. 4M).—Shorter than carapace and covered by few setae.

Telson. Smooth, with posterior convex margin bearing 4 setae.

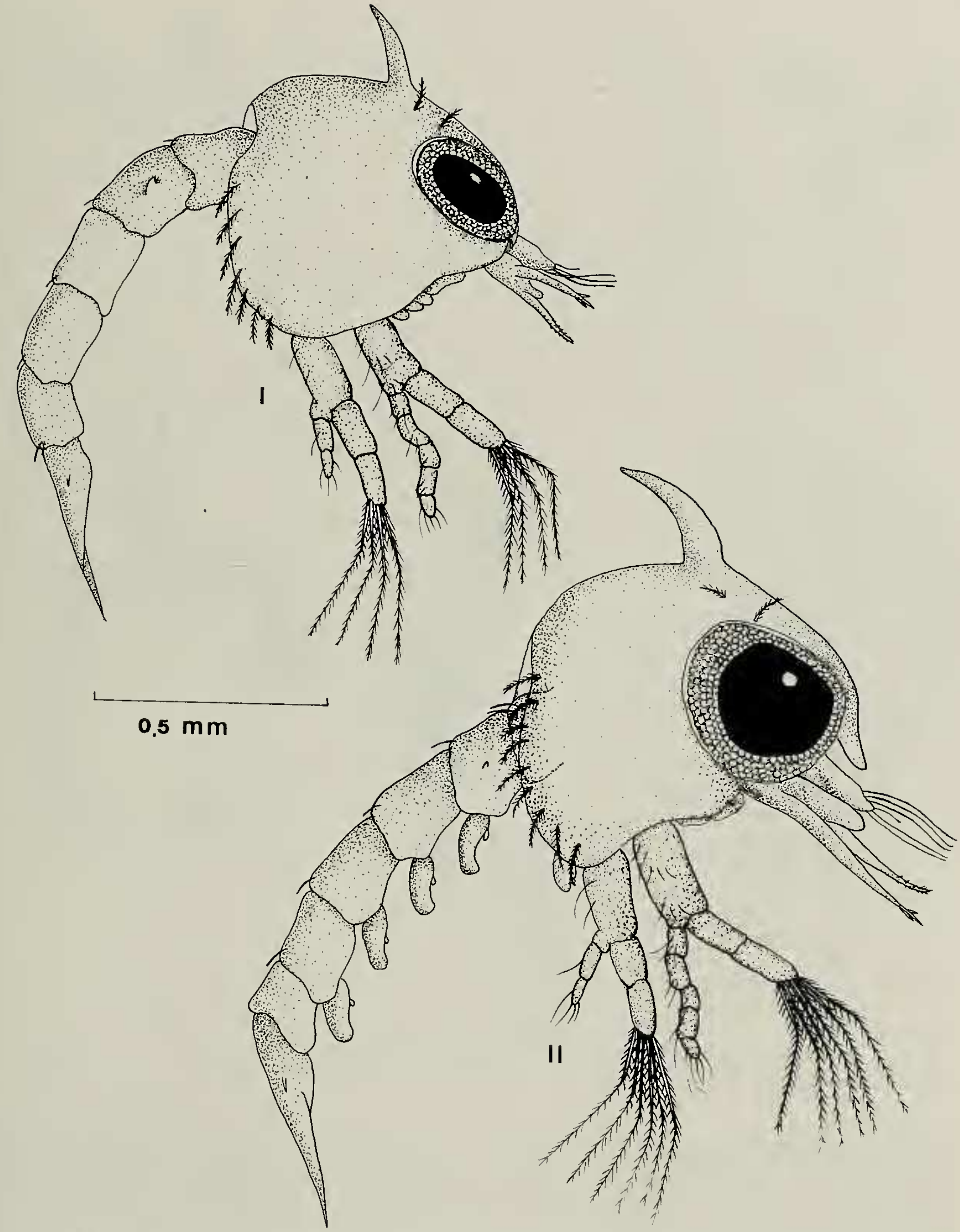

Fig. 1. *Epialtus bituberculatus* H. Milne Edwards, 1834. Lateral view of first (I) and second (II) zoea.

Antennule (Fig. 6a).—Peduncle 3-segmented. One-segmented endopod with 3 apical setae and 1 subterminal simple seta. Exopod 4-segmented, bearing 0, 6, 6, 2 aesthetascs and 1 simple seta on segment 2.

Antenna (Fig. 6b).—Peduncle 3-segmented, with 0, 1 and 1 simple setae. Flagellum 5-segmented, bearing 2 simple setae on each distal segment.

Mandible (Fig. 6c).—Flat, with dentate

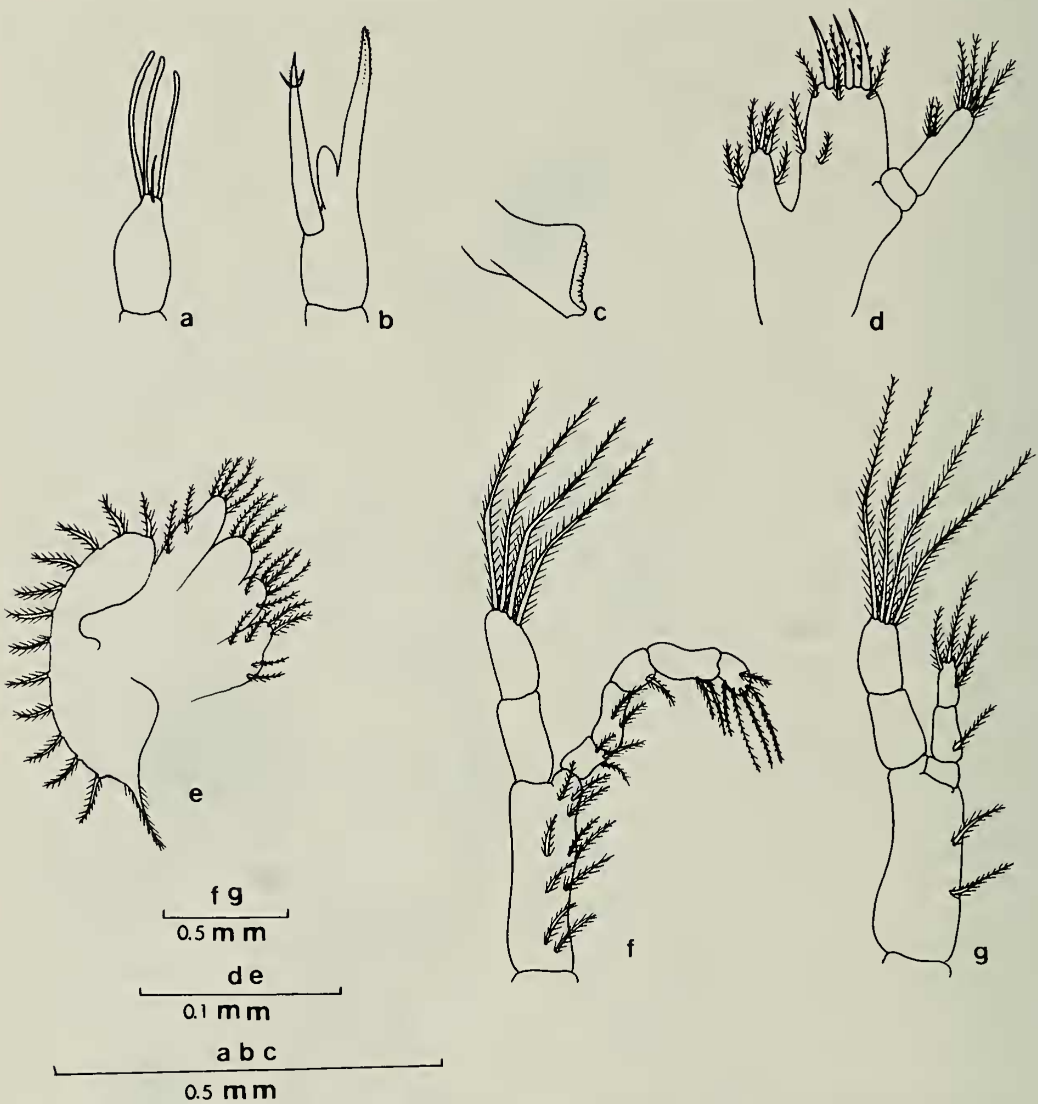

Fig. 2. *Epialtus bituberculatus* H. Milne Edwards, 1834. Appendages of the first zoea: a, antennule; b, antenna; c, mandible; d, maxillule; e, maxilla; f, first maxilliped; g, second maxilliped.

inner margin. Palp 2-segmented, with 6 simple setae on terminal segment.

Maxillule (Fig. 6d).—Coxal endite with 7 and basial endite with 11 setae. Protopod with 1 seta. Endopod unsegmented and naked.

Maxilla (Fig. 6e).—Coxal endite unilobed with 6 setae. Basial endite unilobed bearing 10 setae. Endopod naked. Scaphognathite with 30 marginal plumose setae and 2 small plumose setae on the blade surface.

First maxilliped (Fig. 6f).—Coxal endite has about 3 plumose setae and basial endite 6 setae; both endites have additional setae. Two-segmented endopodite distally with 6 setae. Exopod 2-segmented, with 1 simple seta on proximal and 2 plumose setae on terminal segment. Epipod with 5 long setae.

Second maxilliped (Fig. 6g).—Endopod 4-segmented with 0, 1, 3 and 5 setae. Exopod 2–segmented with 0 and 4 plumose setae. Epipod absent.

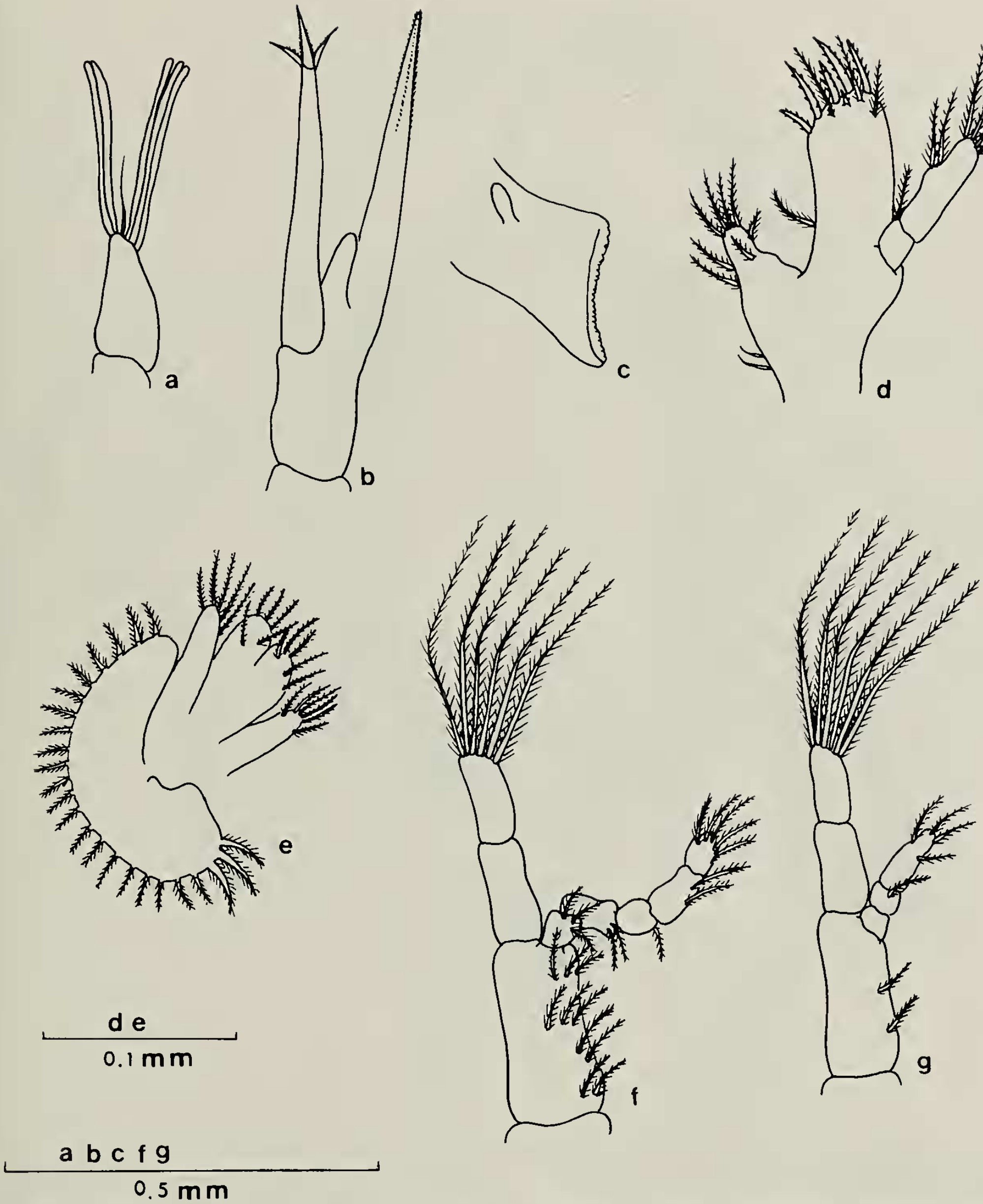

Fig. 3. *Epialtus bituberculatus* H. Milne Edwards, 1834. Appendages of the second zoea: a, antennule; b, antenna; c, mandible; d, maxillule; e, maxilla; f, first maxilliped; g, second maxilliped.

Third maxilliped (Fig. 6h).—Endopod 5-segmented, bearing several simple and plumose setae on all segments. Ischiopodite with 5 spines. Exopod 2-segmented with 1, 2 setae. Epipod with 5 plumose setae and one simple seta.

Pereiopods (Fig. 7a–e).—Chelipeds symmetrical. Second pair of pereiopods with spine on basi-ischium. The second, third, fourth and fifth pairs of pereiopods carry 5 spine-like process on the inferior border of the dactylus. Other segments are covered by setae as shown.

Pleopods (Fig. 7f–i).—Fully developed

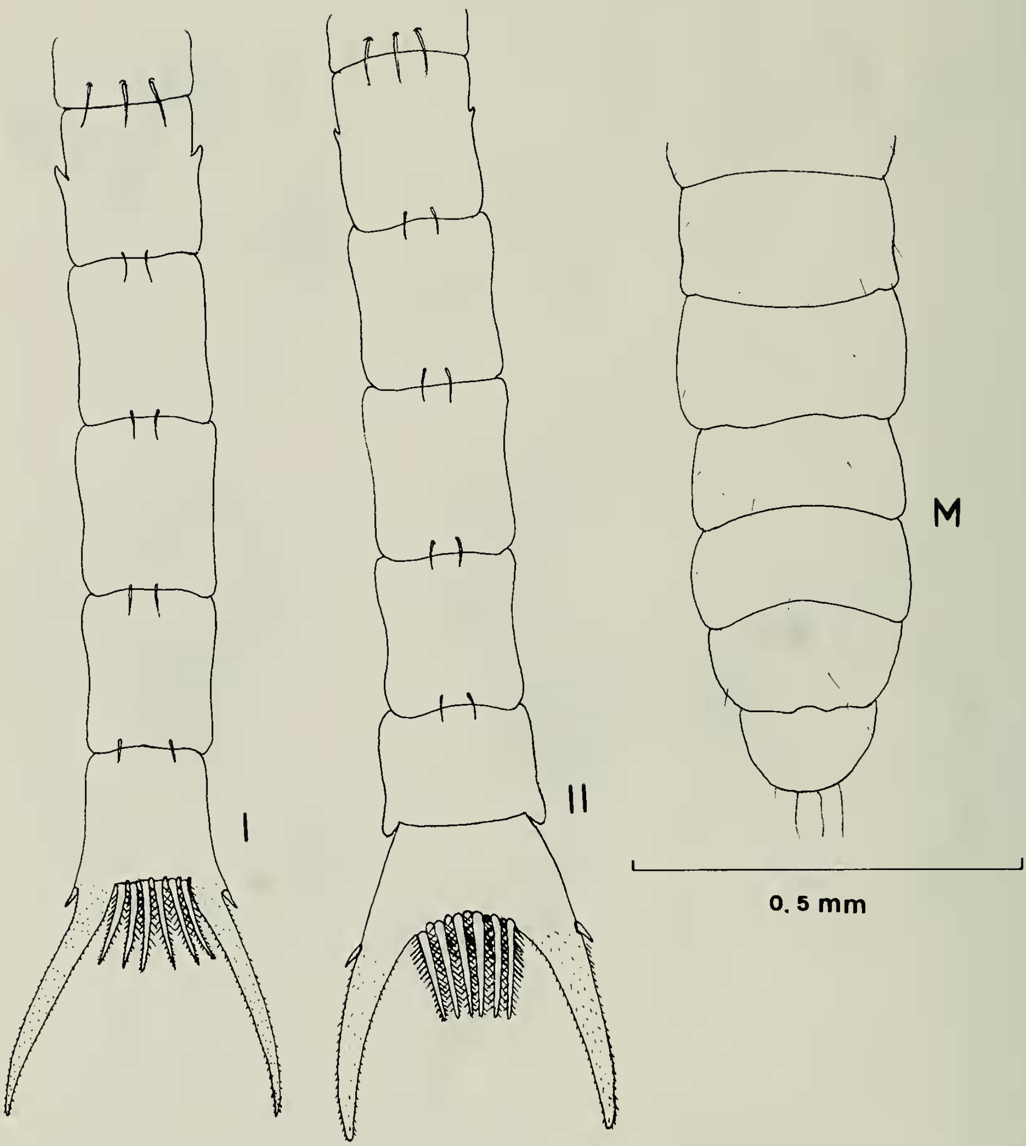

Fig. 4. *Epialtus bituberculatus* H. Milne Edwards, 1834. Dorsal view of telson: first zoea (I); second zoea (II), and megalopa (M).

biramous setose pleopods on abdominal somites 2–5. Exopods of somites 2–5 with 10, 10, 10, 8 plumose natatory setae, respectively. Endopods with 2 hooks each.

Uropod (Fig. 7j).—Uniramous and 2-segmented, with 4 terminal plumose setae.

Discussion

The larval development in the Majidae is distinct from other brachyuran families in that it consists of only two zoeal stages and one megalopa. According to Gore (1985), this brachyuran family is characterized by advanced development, in which the young hatch as zoeae, but in a state more developed than in other families. This is characterized by fewer stages as well as shorter duration of stages.

Among Majidae of the Southwest Atlantic, the time required to reach the megalopa

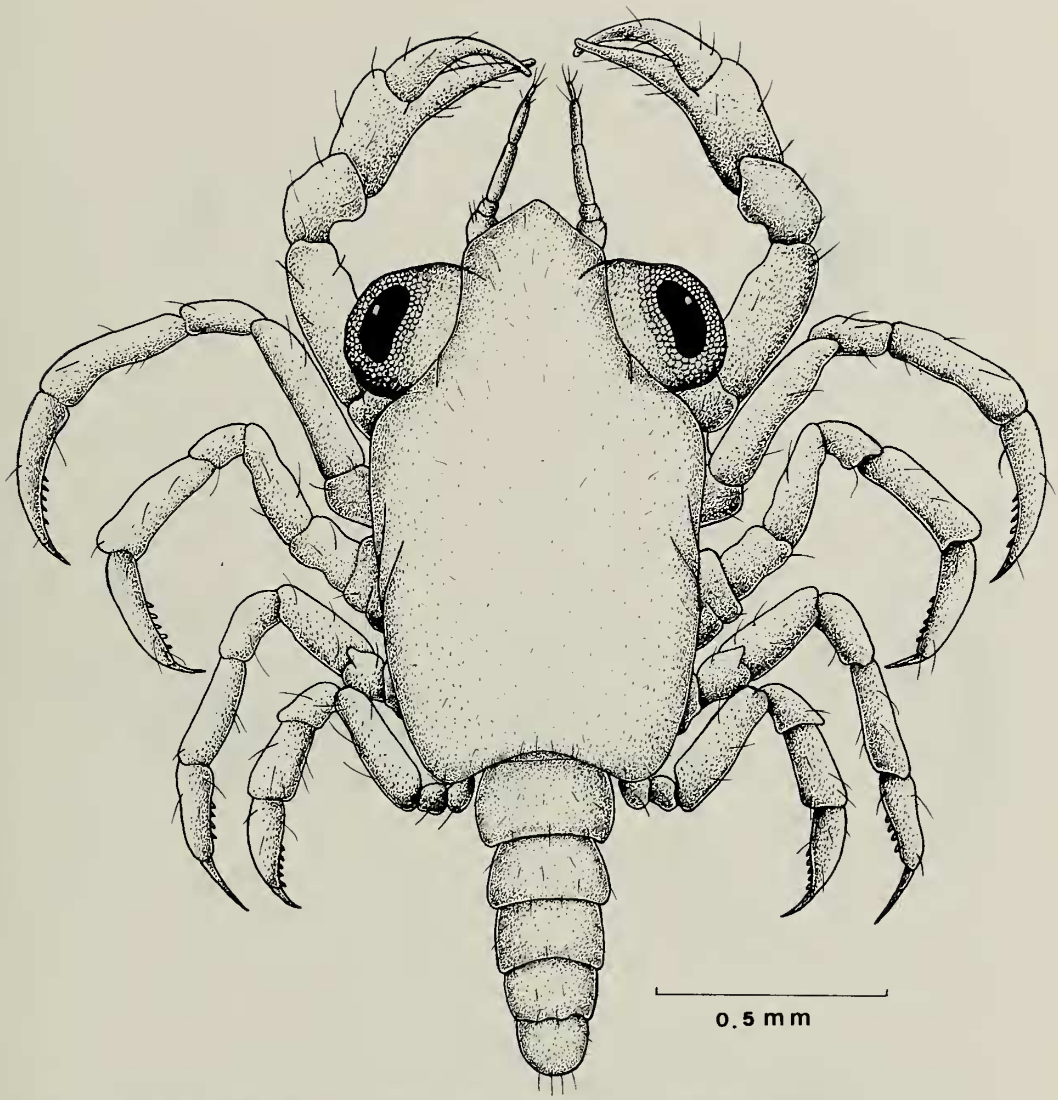

Fig. 5. *Epialtus bituberculatus* H. Milne Edwards, 1834. Dorsal view of megalopa.

is relatively short compared to other brachyuran species (Fransozo & Hebling 1982). The shortest larval development of majids might represent a specialization that may be linked to the existing large species diversity of this group.

Unlike other brachyurans, such as Xanthidae that shows great variation in antennal morphology; Majidae larvae from the southwestern Atlantic coast are morphologically conservative, for example, in antenna and telson.

Rice (1980) identified the diagnostic morphological features for majid zoeae as: telson with well developed furcae that are often covered with minute spinules, maxillary scaphognathite with at least nine marginal setae, and well developed pleopods on the second zoeal stage. Negreiros-Fransozo & Fransozo (1991) summarized the main features that can be used for identification at the subfamily level for species occurring along the south and southeastern Brazilian coast.

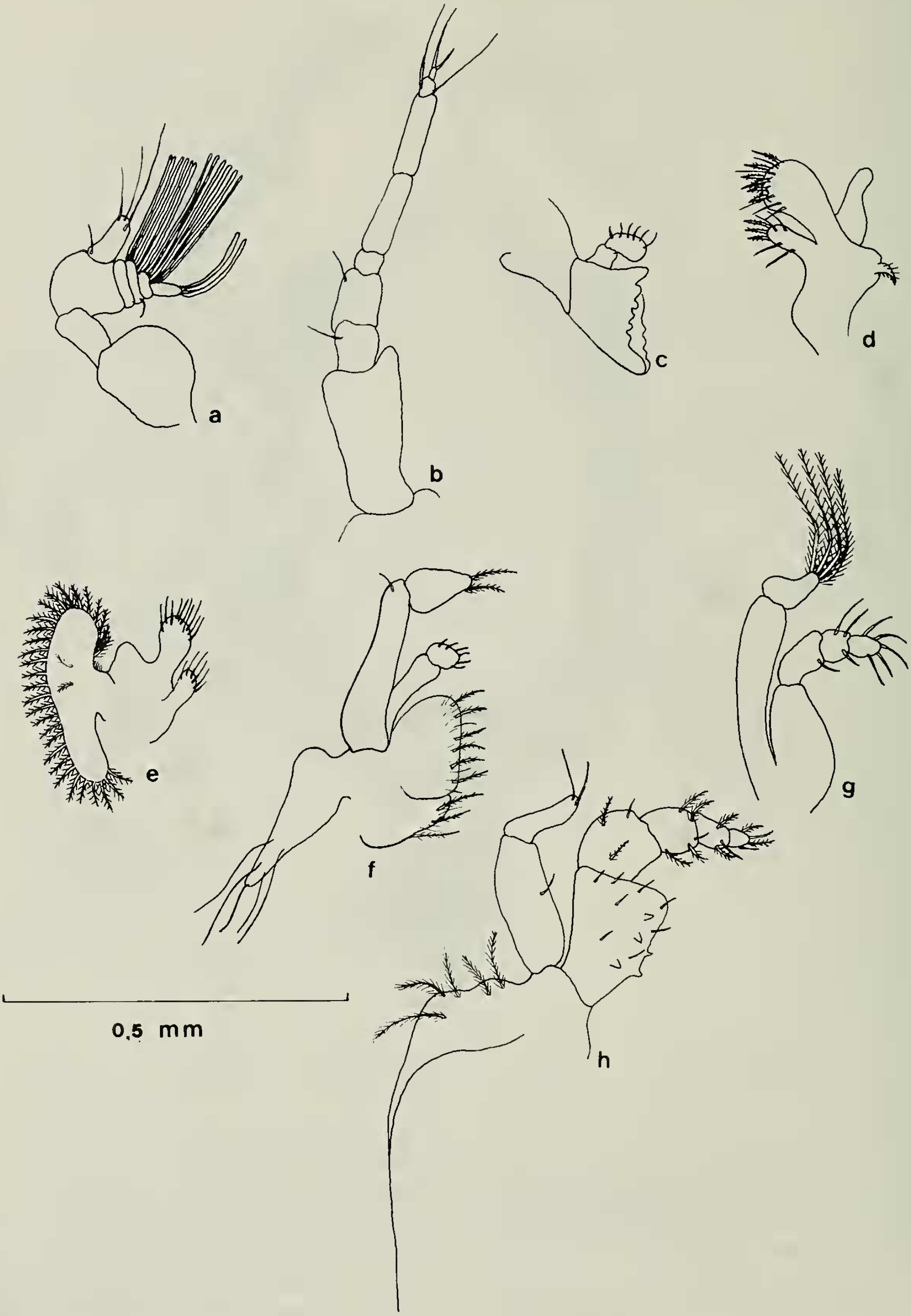

Fig. 6. *Epialtus bituberculatus* H. Milne Edwards, 1834. Appendages of the megalopa: a, antennule; b, antenna; c, mandible; d, maxillule; e, maxilla; f, first maxilliped; g, second maxilliped; h, third maxilliped.

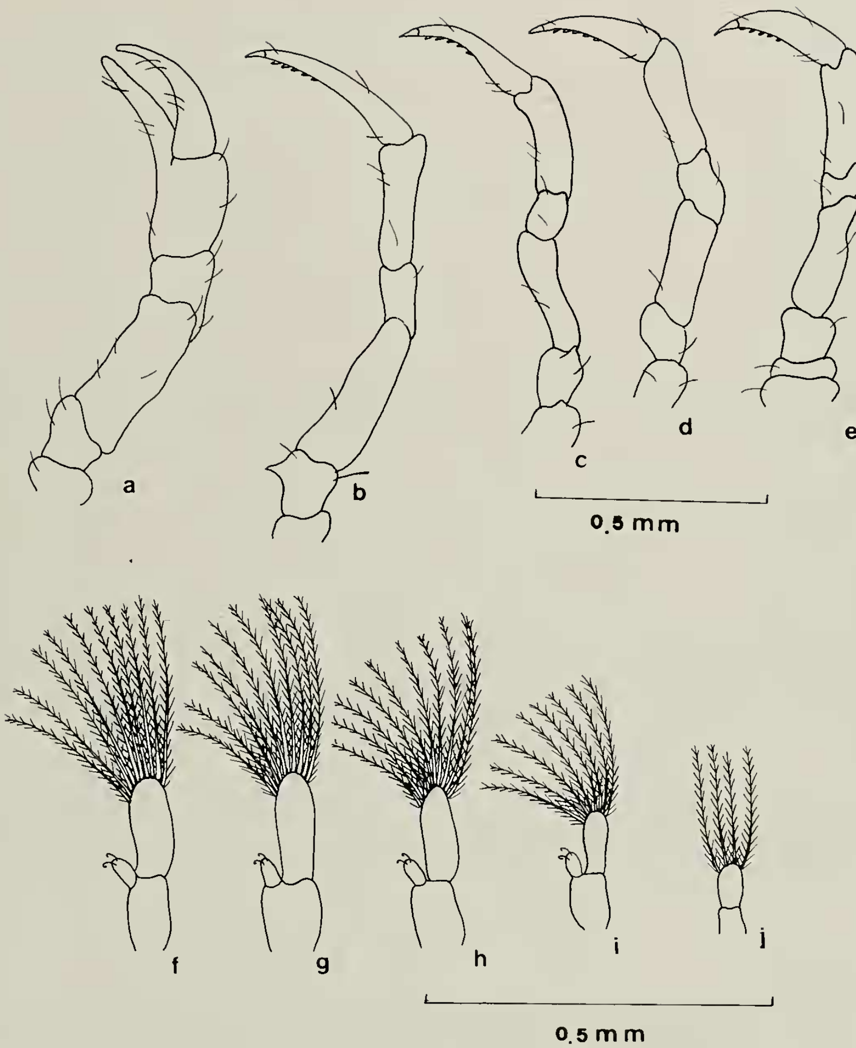

Fig. 7. *Epialtus bituberculatus* H. Milne Edwards, 1834. Appendages of the megalopa: a, cheliped; b, c, d, e, second to fifth pereiopods; f, g, h, i, second to fifth pleopods and j, uropod.

Tables 1 to 3 summarize the main features that characterize the larvae of the Majidae subfamilies from the southwestern Atlantic, and the following key will aid in their identification.

Subfamily level identification key for zoea I and II of Majidae occuring along the southwestern Atlantic coast

1. Carapace with forehead protuberance between the dorsal and rostral spines .... Inachinae
– Carapace without forehead protuberance 2
2. Carapace with only dorsal spine .... Inachoidinae
– Carapace with rostral and dorsal spine 3
3. Abdominal somites with postero-lateral process 4
– Abdominal somites without postero-lateral process .... Epialtinae
4. Maxillary scaphognathite with 12 or 13 plumose setae in zoea I, and 23 to 26 setae in zoea II 5

Table 1.—Comparison of the first zoeal stage of Majidae from southwestern Atlantic region.

Subfamilies	Species	Characteristics: Spines and setae on the carapace	Knobs on lateral side of the abdomen	Postero-lateral process on abdomen	Maxillule endopod setation	Scaphognathite (marginal plumose setae + apical process)	Maxilla endopod setation	Setae on basis of the 1st maxilliped	Setae on the endopod of 2nd maxilliped
Pisinae	*Libinia spinosa*	1 rostral 1 dorsal + 7 setae	2nd somite	on 3rd to 5th somites	1+5	10+1	4	2, 2, 3, 3	0, 1, 4
	Libidoclaea granaria	1 rostral 1 dorsal + 5 setae	2nd somite	on 3rd to 5th somites	1+5	14+1	6	2, 2, 3, 3	0, 1, 5
	Libinia ferreirae	1 rostral 1 dorsal + 6(7) setae	2nd somite	on 3rd to 5th somites	1+5	10+1	5	2, 2, 3, 3	0, 1, 5
Mithracinae	*Mithraculus forceps*	1 rostral 1 dorsal + 6 setae	2nd somite	on 3rd to 5th somites	1+6	13	5	2, 2, 3, 3	0, 1, 5
	Mithraculus coryphe	1 rostral 1 dorsal + 6 setae	2nd somite	on 3rd to 5th somites	1+6	12+1	5	2, 2, 3, 3	0, 1, 5
	Mithrax verrucosus	1 rostral 1 dorsal + 3 setae	2nd somite	on 3rd to 5th somites	—	12+1	—	—	0, 1, 5
	Mithrax caribbeaus	1 rostral 1 dorsal + 7 setae	2nd somite	on 3rd to 5th somites	1+6	12+1	5	2, 2, 3, 3	0, 1, 5
	Mithrax hispidus	1 rostral 1 dorsal + 6 setae	2nd somite	on 3rd to 5th somites	1+6	12+1	5	2, 2, 3, 3	0, 1, 5
	Microphrys bicornutus	1 rostral 1 dorsal + 6 setae	2nd somite	on 3rd to 5th somites	1+6	12 (13)+1	5	2, 2, 3, 3	0, 1, 5
Inachinae	*Eurypodius latreillei*	1 rostral 1 dorsal 2 laterals + 4 setae	2nd and 3rd somites	on 3rd and 4th somites	1+6	10	6	2, 2, 3, 3	0, 1, 5

Table 1.—Continued.

Subfamilies	Species	Characteristics: Spines and setae on the carapace	Knobs on lateral side of the abdomen	Postero-lateral process on abdomen	Maxillule endopod setation	Scaphognathite (marginal plumose setae + apical process)	Maxilla endopod setation	Setae on basis of the 1st maxilliped	Setae on the endopod of 2nd maxilliped
	Stenorhynchus seticornis	1 dorsal 1 anterolateral projections + 3(4) setae	2nd and 3rd somites	on 3rd to 5th somites	4	10+1	5	2, 2, 2, 3	0, 1, 5
Inachoidinae	*Anasimus latus*	1 dorsal 1 pair of ocular and several setae	2nd somite	on 3rd to 5th somites	3	10+1	5	2, 2, 2, 3	0, 1, 4
	Pyromaia tuberculata	1 dorsal	2nd somite	absent	4	10+1	3	2, 2, 2, 2	0, 1, 4
Tychinae	*Pitho lherminieri*	1 rostral 1 dorsal + 7 setae + 2 post-orbital	2nd somite	on 3rd to 5th somites	1+5	13+1	5	2, 2, 3, 3	0, 1, 5
Epialtinae	*Taliepus dentatus*	1 rostral 1 dorsal + 4 setae	2nd somite	absent	1+5	10+1	4	2, 2, 2, 3	0, 1, 4
	Epialtus brasiliensis	1 rostral 1 dorsal + 4(5) setae + 2 post-orbital	2nd somite	absent	6	12+1	5	2, 2, 2, 3	0, 1, 4
	Acanthonyx scutiformis	1 rostral 1 dorsal smooth	2nd somite	absent	4	11+1	5	2, 2, 3, 3	0, 1, 4
	Epialtus bituberculatus	1 rostral 1 dorsal + 7 setae + 2 post-orbital	2nd somite	absent	6	12+1	6	2, 2, 3, 3	0, 1, 4

L. spinosa, L. granaria, L. ferreirae, M. forceps, M. coryphe, M. verrucosus, M. caribbeaus, M. hispidus, M. bicornutus, E. latreillei, S. seticornis, A. latus, P. tuberculata, P. llerminieri, T. dentatus, E. brasiliensis, A. scutiformis respectively described by Clark et al. (1998), Fagetti (1969), Bakker et al. (1990), Wilson et al. (1979), Scotto & Gore (1980), Bolaños & Scelzo (1981), Bolaños et al. (1990), Goy et al. (1981) and Fransozo & Hebling (1982), Gore et al. (1982), Campodónico & Guzmán (1972), Yang (1976), Sandifer & van Engel (1972), Fransozo & Negreiros-Fransozo (1997), Bolaños et al. (1996), Fagetti & Campodónico (1971), Negreiros-Fransozo & Fransozo (1991), Hiyodo et al. (1994).

Table 2.—Comparison of the second zoeal stage of Majidae from southwestern Atlantic region.

		Characteristics							
Subfamilies	Species	Spines and setae on the carapace	Knobs on lateral side of the abdomen	Postero-lateral process on abdomen	Maxillule endopod setation	Scaphognathite (marginal + apical)	Maxilla endopod setation	Setae on basis of the 1st maxilliped	Setae on the endopod of 2nd maxilliped
Pisinae	*Libinia spinosa*	1 rostral 1 dorsal + 8 setae	2nd somite	on 3rd to 5th somites	1+5	20	5	2, 2, 3, 3	0, 1, 4
	Libidoclaea granaria	1 rostral 1 dorsal + 7 setae	2nd somite	on 3rd to 5th somites	1+5	29	5	2, 2, 3, 3	0, 1, 5
	Libinia ferreirae	1 rostral 1 dorsal + 8 setae	2nd somite	on 3rd to 5th somites	1+5	20	5	2, 2, 3, 3	0, 1, 5
Mithracinae	*Mithraculus forceps*	1 rostral 1 dorsal + 7 setae	2nd somite	on 3rd to 5th somites	1+6	24	5	2, 2, 3, 3	0, 1, 5
	Mithraculus coryphe	1 rostral 1 dorsal + 6 setae	2nd somite	on 3rd to 5th somites	1+6	25	5	2, 2, 3, 3	0, 1, 5
	Mithrax verrucosus	1 rostral 1 dorsal + 6 setae	—	on 3rd to 5th somites	—	26	—	—	0, 1, 5
	Mithrax caribbeaus	1 rostral 1 dorsal + 8 setae	2nd somite	on 3rd to 5th somites	1+6	24	5	2, 2, 3, 3	0, 1, 5
	Mithrax hispidus	1 rostral 1 dorsal + 8 setae	2nd somite	on 3rd to 5th somites	1+6	24 (25)	5	2, 2, 3, 3	0, 1, 4
	Microphrys bicornutus	1 rostral 1 dorsal + 10 setae	2nd somite	on 3rd to 5th somites	1+6	23 (25)	5	2, 2, 3, 3	0, 1, 5
Inachinae	*Europodius latreillei*	forehead protuberances 1 rostral 1 dorsal 2 laterals + 4 setae	2nd and 3rd somites	on 3rd and 4th somites	1+6	20 (21) plumose setae	6	2, 2, 3, 3	0, 1, 5
	Stenorhynchus seticornis	forehead protuberances 1 dorsal	2nd and 3rd somites	on 3rd and 5th somites	4	19 (20) plumose setae	4(5)	2, 2, 2, 3	0, 1, 4
Inachoidinae	*Anasimus latus*	1 dorsal 1 pair of ocular	2nd somite	on 3rd and 5th somites	3	20 plumose setae	5	2, 2, 2, 3	0, 1, 4
	Pyromaia tuberculata	1 dorsal 3 setae	2nd somite	absent	4	20 plumose setae	4	2, 2, 2, 2	0, 1, 4

Table 2.—Continued.

Subfamilies	Species	Characteristics: Spines and setae on the carapace	Knobs on lateral side of the abdomen	Postero-lateral process on abdomen	Maxillule endopod setation	Scaphognathite (marginal + apical)	Maxilla endopod setation	Setae on basis of the 1st maxilliped	Setae on the endopod of 2nd maxilliped
Tychinae	*Pitho lherminieri*	1 rostral 1 dorsal 7 marginal setae + 4 setae	2nd somite	on 3rd and 5th somites	1+5	26 plumose setae	5	2, 2, 3, 3	1, 1, 5
Epialtinae	*Taliepus dentatus*	1 rostral 1 dorsal 4 setae	2nd and 3rd somites	absent	1+5	20 plumose setae	4	2, 2, 2, 3	0, 1, 4
	Epialtus brasiliensis	1 rostral 1 dorsal 7 setae + post-orbital	2nd somite	absent	6	19+1 plumose setae	6	2, 2, 2, 3	0, 1, 4
	Acanthonyx scutiformis	1 rostral 1 dorsal smooth	2nd somite	absent	4	22 plumose setae	5	2, 2, 3, 3	0, 1, 4
	Epialtus bituberculatus	1 rostral 1 dorsal 9 marginal setae + 2 post-orbital	2nd somite	absent	1, 6	20 (21) plumose setae	5 (6)	2, 2, 3, 3	0, 1, 4

L. spinosa, L. granaria, L. ferreirae, M. forceps, M. coryphe, M. verrucosus, M. caribbeaus, M. hispidus, M. bicornutus, E. latreillei, S. seticornis, A. latus, P. tuberculata, P. llerminieri, T. dentatus, E. brasiliensis, A. scutiformis respectively described by Clark et al. (1998), Fagetti (1969), Bakker et al. (1990), Wilson et al. (1979), Scotto & Gore (1980), Bolaños & Scelzo (1981), Bolaños et al. (1990), Goy et al. (1981) and Fransozo & Hebling (1982), Gore et al. (1982), Campodónico & Guzmán (1972), Yang (1976), Sandifer & van Engel (1972), Fransozo & Negreiros-Fransozo (1997), Bolaños et al. (1996), Fagetti & Campodónico (1971), Negreiros-Fransozo & Fransozo (1991), Hiyodo et al. (1994).

Table 3.—Comparison of the megalopa stage of Majidae from southwestern Atlantic region.

Subfamilies	Species	Characteristics: Expopod of antennule	Palp of mandible	Scaphognathite setae (marginal + superficial)	Setae on epipod of 3rd maxilliped	Uropod setae
Pisinae	*Libinia spinosa*	4-segmented 14 aesthetascs + 1 seta	3-segmented 0, 0, 5 setae	36	8	5
	Libidoclaea granaria	4-segmented 13 aesthetascs	3-segmented 0, 0, 5 setae	51	14	9
	Libinia ferreirae	3-segmented 10 setae	3-segmented 0, 0, 5 setae	38	6	5
Mithracinae	*Mithraculus forceps*	2-segmented 12 aesthetascs + 1 seta	unsegmented 5 setae	26 (30)	5	5
	Mithraculus coryphe	2-segmented 14 aesthetascs	2-segmented 0, 5 setae	32	6	4
	Mithrax verrucosus	2-segmented 13 aesthetascs	unsegmented 5 setae	31	4	5
	Mithrax caribbeaus	2-segmented 15 aesthetascs	unsegmented 5 setae	32	5	5
	Mithrax hispidus	3-segmented 12 aesthetascs + 1 seta	unsegmented 5 setae	28 (31)	6	5
	Microphrys bicornutus	2-segmented 13 aesthetascs	2-segmented 0, 5 (6) setae	28 (39)	5	4 (5)
Inachinae	*Europodius latreillei*	5-segmented 9 aesthetascs + 3 setae	—	39 (40)	12	5
	Stenorhynchus seticornis	3-segmented 13 (14) aesthetascs	2-segmented 0, 6 setae	32	6	2
Inachoidinae	*Anasimus latus*	3-segmented 10 aesthetascs + 2 setae	3-segmented 0, 0, 6 setae	28 to 30	3	4
	Pyromaia tuberculata	4-segmented 9 aesthetascs	2-segmented 0, 4 setae	32 (35) + 3	4	2

Table 3.—Continued.

Subfamilies	Species	Characteristics				
		Expopod of antennule	Palp of mandible	Scaphognathite setae (marginal + superficial)	Setae on epipod of 3rd maxilliped	Uropod setae
Tychinae	*Pitho lherminieri*	2-segmented 9 aesthetascs + 2 setae	2-segmented 0, 5 setae	31 (32) + 2	6	5
Epialtinae	*Taliepus dentatus*	4-segmented 15 aesthetascs + 4 setae	2-segmented 0, 5 setae	40	9	5
	Epialtus brasiliensis	4-segmented 13 aesthetascs + 3 setae	3-segmented 0, 0, 5 setae	38	10	5
	Acanthonyx scutiformis	4-segmented 12 aesthetascs	2-segmented 0, 5 setae	42	3	5
	Epialtus bituberculatus	4-segmented 14 aesthetascs + 1 simple seta	2-segmented 0, 6 setae	30	6	4

L. spinosa, L. granaria, L. ferreirae, M. forceps, M. coryphe, M. verrucosus, M. caribbeaus, M. hispidus, M. bicornutus, E. latreillei, S. seticornis, A. latus, P. tuberculata, P. llerminieri, T. dentatus, E. brasiliensis, A. scutiformis respectively described by Clark et al. (1998), Fagetti (1969), Bakker et al. (1990), Wilson et al. (1979), Scotto & Gore (1980), Bolaños & Scelzo (1981), Bolaños et al. (1990), Goy et al. (1981) and Fransozo & Hebling (1982), Gore et al. (1982), Campodónico & Guzmán (1972), Yang (1976), Sandifer & van Engel (1972), Fransozo & Negreiros-Fransozo (1997), Bolaños et al. (1996), Fagetti & Campodónico (1971), Negreiros-Fransozo & Fransozo (1991), Hiyodo et al. (1994).

– Maxillary scaphognathite with 10 or 14 plumose setae in zoea I and 20 or 29 plumose setae in zoea II .... Pisinae
5. Endopod of the maxillule with 1, 1 + 4 plumose setae .... Tychinae
– Endopod of the maxillule with 1, 2 + 4 plumose setae .... Mithracinae

This key can also be used in conjunction with the comparative features for each larval stage given in Tables 1–3.

Information in Tables 1–3 shows that larvae of *Epialtus bituberculatus* are very similar to those of *E. brasiliensis* and *Acanthonyx scutiformis,* with only slight setal differences on the carapace, maxillule and second maxilliped. These epialtinids species share an unilobed coxal endite of the maxilla, which is also present in *E. dilatatus* studied by Yang (1968). Although reduction of maxillary endites in larval Anomura and Brachyura has been discussed by van Dover (1982), she did not mention the single reduction of the coxal endite in such majids.

Overall, we agree with Marques & Pohle (1998), that larval descriptions of other epialtinids are needed to improve our understanding of phylogenetic relationships among majids.

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